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THE
NEW METHOD

OF
INOCULATING

FOR THE
SMALL POX,

DELIVERED

A LECTURE IN THE UNI-
VERSITY OF PHILADELPHIA,
Feb. 20th, 1781.

BY BENJAMIN RUSH, M. D. *R*

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TO THE
STUDENTS OF MEDICINE
IN THE
MEDICAL SCHOOL OF PHILADELPHIA

THE FOLLOWING LECTURE
IS INSCRIBED;

AS A TESTIMONY OF THE CONSTANT AND
PUNCTUAL ATTENDANCE, WITH WHICH
THEY WERE PLEASED TO HONOUR THE
LECTURES UPON THE PRACTICE OF PHY-
SIC, DELIVERED (AT THEIR REQUEST) IN
THE WINTER OF 1780—1.

BY THEIR FRIEND

AND HUMBLE SERVANT

THE AUTHOR.

GENTLEMEN,

IT must afford no small pleasure to a benevolent mind in the midst of a war, which daily makes so much havock with the human species, to reflect, that the small-pox which once proved equally fatal to thousands, has been checked in its career, and in a great degree subdued by the practice of INOCULATION.

It is foreign to my purpose to deliver to you the history of this art, and to mark the various steps that have attended its progress to its present state of improvement. We have yet to lament the want of uniformity and of equal success in the practice of it among physicians. A great number of pamphlets have been written upon the subject without exhausting it. There is still ample room left for the man of genius to exercise his talents for observation and reasoning on it. The facts I mean to lay before you are so inconsiderable, compared with what still remains to be known upon this subject, that I have to request, when your knowledge in it is completed,

that you would bury my name in silence ;
 I forget that ever I ventured to lay a single
 line in this part of the fabric of science.

In treating upon this subject, I shall

I. Consider the proper subjects and seasons for Inoculation.

II. I shall describe the method of communicating the disorder.

III. I shall consider the method of preparing the body for the small-pox.

IV. I shall mention the treatment proper during the eruptive fever, and

V. Point out a few cautions that are necessary after the disease is over.

I. Formerly there were great difficulties in the choice of the subjects for *Inoculation*. But experience teaches us that it may be practised at every stage of life, and in almost every condition of the human body.—In infancy the periods before and after dentition are to be preferred.—But we seldom see any great inconveniences from submitting to the general necessity of inoculating children between the ages of three months

months and two years.—Indeed we often children cut three or four teeth during the preparation and eruptive fever without the least addition being made to any of the troublesome symptoms which accompany the small-pox. There is no inconvenience attending the choice of the first months of infancy for inoculating, and the matter often fails of producing the disorder in such young subjects. I have frequently failed in two or three attempts to communicate the disorder to children under four months old with the same matter that has succeeded in a dozen other patients inoculated at the same time.—When the inoculation succeeds in such tender subjects, they generally have less fever, and fewer pustules than are common in any future period of life.

Altho' a physician would prefer a patient in good health to any other as a subject for inoculation, yet cases often occur in which it is necessary to communicate the small-pox while the body is affected with some other disorder. I have with pleasure inform you, that the small-pox is rendered so perfectly safe by inoculation, that there are few chronic diseases which should be considered as obstacles in the way of it. I have inoculated patients labouring under

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dian fever, obstructed viscera, the whooping
 cough, the hypochondriasis, the asthma, the
 and other cutaneous disorders, and even
 pregnant women with the same, and in some in-
 stances, with greater success than persons in perfect
 health. Doct. *Cullen* informs us that he has seen
 inoculation succeed in scrophulous patients. A
 physician in *Jamaica* informed me that he had
 inoculated Negroes with success in the worst stage
 of the Yaws.—To these facts I must add one more
 extraordinary than any that has been yet men-
 tioned.—Doct. *Brown*, my late colleague in the
 of the military hospitals, informed me, that he
 had seen Inoculation succeed in patients who were
 seized, after the infection was communicated,
 with the hospital fever.—The preparation of the
 body should be accommodated to the disease which
 affects it. Some physicians have thought the
 small-pox received in this way, was a remedy for
 other diseases, but my experience has not confirm-
 ed this opinion. On the contrary I am disposed
 to think that no other change is produced by
 inoculation than by the regimen and medicines
 that are used to prepare the body for the small-
 pox. Nor does the small-pox during its conti-
 nuance afford any security against the attacks of
 other diseases. I have seen the most alarming
 com-

complication of the small-pox and measles in the same person.

The seasons commonly preferred for Inoculation in this country are the spring and autumn. It may be practised with equal safety in the winter, a due regard being had to the temperature of the air in the preparation of the body.

The principal objection to inoculating in the summer months in this climate, arises from the frequency of bilious disorders at that season, to which the preparation necessary for small-pox probably disposes the body. This objection applies more directly to children who at a certain age are more subject than grown people to a disorder in their bowels in warm weather.

II. The methods of communicating small-pox by Inoculation, have been different in different countries and in the different stages of its progress towards its present stage of improvement. The scab, doffel of lint, and thread impregnated with variolous matter bound up in a gash in the arm, have been laid aside.

We

We are indebted to Mr. *SMITH* for the mode of communicating it by a slight puncture with the point of a lancet or needle dipt in the matter. As it is difficult sometimes to procure matter in a fresh state, I have been led to use it with equal success by preserving it on ice in a box, and moistning it with cold water before I used it. Matter may be kept in this way for a month without loosing its infectious quality, provided it is not exposed to heat or moisture. The former destroys its power of infecting as certainly as the salt of tartar destroys the acidity of vinegar. Moisture by remaining long upon the matter, probably destroys its virulence by subjecting it to fermentation. The longer matter has been kept in a general way, the longer the distance will be between the time of communicating the disorder and the eruptive fever. It will be proper always to yield to the prejudices of our patients in favour of matter taken from persons who have but few pustules. But I am persuaded from repeated observations, that the disease is no ways influenced by this circumstance. I am satisfied likewise that there is no difference between the effects of the matter whether it be taken in its watery or purulent state. The puncture should not be deeper than is sufficient to draw one drop of blood.

—No plaster nor bandage should be applied to it. It should be made in the left arm of subjects. The objections to inoculating in the leg are too obvious to be mentioned. I have heard of the disease being communicated by rubbing the dry skin with the matter. My observations upon this subject give me reason to suspect the facts that are contained in books relative to this mode of infecting the body. I have bound large pieces of lint dipt in fresh matter for 24 hours upon the arm without producing disorder. A practitioner of physic in New-York informed me that he once gave a considerable quantity of fresh variolous matter in a dose of physic without infecting his patient. I suspect the matter that produces the disease is of the same nature with certain poisons, which require to be brought in contact with a wound or abrasion in the body before they produce their effects. I deliver this opinion with diffidence. The subject stands in need of more experiments and investigation.

III. I come now to consider the best method of preparing the body for the small-pox. This must be done 1st by DIET, and 2dly by MEDICINE.—The DIET should consist chiefly of vegetables. I have never seen any inconvenience

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from the free use of milk as a part of the preparative diet. In some habits where a morbid humour prevails in the stomach, we may indulge our patients in a little weak flesh broth two or three times a week with safety.—Tea, coffee, and even weak chocolate with biscuit or *dry* bread may be used as usual by persons accustomed to that kind of aliment. Wine and spirits of all kinds should be withheld from our patients during the preparation.—The more acescent their drinks are, the better. It is unnecessary that this change in the diet should take place all a day or two before the time of communicating the disorder. The system accommodates a vegetable and low diet in the course of three weeks or a month, so as to defeat in some measure the advantages we expected from it.—The good effects of it appear to depend in a great degree upon the *suddenness* with which we oblige our patients to conform to it. For this reason when we are called upon to inoculate persons who have lived more than three or four weeks upon a low diet, we should always direct them to live a few days upon animal food before we communicate the disorder to them. By these means we may produce all the good effects of the *sudden* change in the diet I have already mentioned.

2. The MEDICINES most commonly used to

to prepare the body for the small-pox are Armony and Mercury. The latter has had preference and has been given in large quantity under a notion of its being a specific antidote to the variolous matter. Many objections may be made to this opinion, I shall mention three.

1. We often see the disorder in a high degree after the system is fully impregnated with mercury.

2. We often see the same salutary effect of mercury when given before the disorder is communicated to the body, that we perceive when it is given after Inoculation in which case we are sure the mercury cannot enter into mixture with the variolous matter so as to destroy it.

3. If mercury acted specifically in destroying the variolous matter, it would render every other part of the preparation unnecessary, this we know is not the case, for the neglect or improper use of the vegetable diet or regimen is often attended with an extraordinary number, or virulence of the small-pox even in those cases where mercury is given in the largest quantity.

The way in which mercury prepares the body for the small-pox seems to be by promoting the several excretions, particularly that by perspiration, which by diminishing the quantity of fluids and weakening the tone of the solids, renders the system less liable to a plentiful eruption of the small-pox. But I object to the use of this medicine for the following reasons.

1. It effectually deprives us of all the benefits of the cool regimen, for mercury we know always *disposes* the system to take cold.
2. It subjects patients after Inoculation to a troublesome and, in some cases, dangerous glandular swellings. This will readily be admitted by all who know the tendency mercury has to stimulate the glandular parts of the body.
3. All the good effects of mercury may be secured by PURGES which do not subject the body to either of the above mentioned inconveniencies.

The PURGES may be suited to the constitutions, and in some cases even to the inclinations of our patients. I have seen jalap—rhubarb—senna—manna—aloes—soluble tartar—Epsom salts—the butternut pill—all

all given with equal success. The quantity should be sufficient to procure three or four stools every day. A little magnesia should always be mixed with rhubarb and jalap in preparing child's diet. It will be sufficient for the mothers and nurses of infants to conform strictly to the vegetable diet. I have never seen any advantages from giving them even a single dose of physic.

It is hardly necessary to observe that the quality—dose—and number of purges are to be determined by the age—sex—and habits of patients. A constitution infeebled with a previous disease forbids the use of purges, and requires medicines of a restorative kind. Patients afflicted with cutaneous disorders bear larger and more frequent doses of physic than are indicated in more healthy subjects.

In adult subjects of a plethoric habit, bloodletting is very useful on the third or fourth day after Inoculation. We are not to suppose, however, that every fat person labours under a plethora. A moderate degree of fat is so far from rendering the disease more violent, especially in children, that I think I have generally found such subjects have the small-pox more favourably than others.

Moderate

Moderate exercise in the open air should be used during the preparation. But hard labour every thing that promotes sweat or fatigue also the extremes of heat and cold, should be avoided.

IV. We come now to consider the treatment of the body during the eruptive fever. On the eighth day after Inoculation our patients are generally seized with the common symptoms of fever. Sometimes this fever appears on the sixth and seventh day after Inoculation. But it is irregular it is often delayed 'till the ninth and tenth days. I have seen many instances of it on the fourteenth, a few on the fifteenth and sixteenth, and one case in which it did not come on 'till the eighteenth day after Inoculation was communicated to the body.—The place where the puncture was made with the lancet or needle generally serves as an harbinger of the approaching fever. A slight inflammation appears about it and a pock comes up in the center. But this remark is subject to some objections. I have seen *four* instances in which the fever came on at the expected time, and the disorder went thro' all its stages with the greatest regularity, and yet there

was

was no sign of an inflammation or pock in the spot where the puncture was made; the puncture itself became invifible.—On the other hand we fometimes fee an inflammation or pock on the arm appear on the eighth and tenth days without any fever accompanying them. Some phyficians pretend that this inflammation or solitary pock are fufficient to conftitute the difeafe; but repeated experience has taught me to be very cautious in relying upon thefe equivocal marks. It is true, I have fometimes feen patients fecured againft the fmall-pox both in the natural way and by Inoculation where thefe marks have appeared; but I have as often feen fuch patients afterwards with the fmall-pox in the natural way to the great diftrefs of families and mortification of phyficians.—Upon this account I make it a constant practice to advife a fecond or third inoculation where a fever and eruption have been wanting.—As the abfence of thefe fymptoms is probably occafioned by the weaknefs or age of the variolous matter, or the too high ftate of preparation of the body, we fhould always guard againft both, by making the puncture the fecond time with *fresh* matter—by fubjecting our patients to a *lefs* abftemious diet, and by giving fewer dofes of phyfic. I have heard it remarked

if a slight redness, and a small pimple appeared on the arm on the third day after Inoculation, it was a sign the matter had infected the whole constitution. I acknowledge I have often seen a greater degree of redness on the third than the second day after Inoculation, but I have not been able to establish a diagnostic mark from this, for I have seen the disease produced on the second day where the redness has appeared on the third day—and in some cases where it has not appeared until the eruptive fever.

I am led here unwillingly to discuss the question, Is it possible to have the small-pox in the natural way after Inoculation?—In many of the cases supposed to be the small-pox after Inoculation, it is probable the matter has been taken from the chicken-pox which resembles small-pox in many of its peculiarities, but none more than that of leaving pits or marks on the skin. But there are certainly cases where there are the most irrefragable proofs of the inoculation implanted by Inoculation being of a variolous nature, where the disorder has been afterwards taken in the natural way. In these cases we should suppose the variolous matter produced on a topical or cuticular disorder. We see some-
 thing analogous to this in nurses who attend pati-

ents in the small-pox. But further—this to
 or cuticular infection may be produced by
 in persons who have had the small-pox in
 natural way. Some years ago I made a puncture
 on my left hand with a lancet moistened with
 viruluous matter. On the eighth day an inflammation
 appeared on the place accompanied with
 efflorescence in the neighbourhood of it which
 extended about two inches in every direction
 the spot where the puncture was made. On the
 11th day I was surprised to find two pocks (which
 I may venture to call them such) the one on the
 outside of my fourth finger on my left hand
 and the other on my forehead. They remained
 there for several days but without filling with
 matter, and then dropped off rather in the
 manner of a soft wart than of a common scab.—
Way of Wilmington repeated the same experiment
 upon himself, but with an issue to his forehead
 of a variety more extraordinary than that I have just
 related. On the eighth day after he had made a
 puncture on his hand, a pock appeared on the
 spot, which in the usual time filled with matter
 from which he inoculated several children who
 sicken'd at the usual time, and went thro' all the
 common stages and symptoms of the small-pox.
 It would seem from these facts that it is

the small-pox should produce some impres-
 sion upon the *whole* system in order to render it
 afterwards incapable of receiving an impres-
 sion of a similar nature. A fever and an erup-
 tion therefore seem necessary for this purpose.
 The inflammation of the arm on the eighth
 day is a sign of the *topical* and cuticular infection,
 and an eruption (tho' ever so small) seems to
 be the only certain sign of the infection of the
 system. The eruption is the more decisive
 sign in proportion as it comes out and
 subsides in the usual manner of the small-pox
 in a natural way. In those cases where pati-
 ents have been secured against a second attack of
 the disorder, where there have been no *obvious*
 or *visible* eruption, I think I have observed
 a usual inflammation, and a copious and long
 continued discharge of matter from the arm.
 This may serve as an outlet of the matter,
 and in other cases produces the fever and e-
 ruption. I am the more disposed to embrace this
 view from the testimony which several authors
 have afforded us of the effects of ulcers in securing the
 system from the infection of the plague. The ef-
 fects of issues are still more to our purpose. We
 observe a plentiful discharge of matter from
 the issue every time the body is exposed to cold, and
 the

the febrile effects of it upon the system are by frequently obviated.—How far a ratio between the degrees of inflammation and the charge of matter from the arm, and the degree of fever and eruption, must be determined by and very accurate observations. If it should appear that there are the least inflammation and the smallest discharge where there have been the highest fever and most copious eruption, on the contrary, if it should appear that there are the greatest inflammation and discharge and the least fever and smallest eruption, I must beg leave to add without attempting in this place to explain the reasons of the remark, if generally true, is liable to exceptions. But the subject is involved in necessity; I shall be satisfied if I have brought you within sight of the promised land. Your ingenuity like another Jewish leader must carry you thither.

The indications in the treatment of the body during the eruptive fever are

- 1st To regulate the degree of fever.
- 2d To mitigate troublesome and alarming symptoms.

The fever which produces the eruption is usually of the inflammatory kind. It sometimes therefore comes on with the symptoms of heat, preceded with chilliness, determination to the head and breast, and a full hard pulse. Remedies proper in this case are

1. Bloodletting. The quantity to be drawn should be regulated by the violence of the symptoms—the constitution—habits, and even countenance of the patient, and by the season of the year.—I have never found more than one bleed sufficient to the quantity of 12 or 14 ounces necessary in any stage or degree of the eruptive fever of the small-pox by Inoculation.

2. Cool air is of the utmost consequence in the eruptive fever. The use of this remedy is a mark an era not only in the management of the small-pox but in medicine. The quantity of cold should always be increased in proportion to the violence of the fever.—Stoves, so common in this country, should be carefully avoided. The more we oblige our patients to get up and walk in the open air the better. In those cases where they languish most for fresh air, they should be encouraged rather to lay on the floor than under the bed cloaths.—Children should

should be stript of flannel petticoats that be in contact with their skins, and even clouts should be laid aside if possible without great inconvenience, and at any rate they should be often moved.—Great and obvious as the advantages of cold air are in the eruptive fever, it has sometimes been used to an excess that has done much chief.—There are few cases where a degree of cold below 40 of *Fahrenheit's* thermometer is necessary in this stage of the small-pox. Where it has been used below this, or where patients have been exposed to a damp atmosphere several degrees above it, I have heard of inflammation of an alarming nature being produced in the throat and breast.

c. The bowels, more especially of children, should be kept open with gentle laxatives. And

d. Cool subacid drinks should be administered plentifully until the eruption is completed.

Sometimes the small-pox comes on with a fever the reverse of that which we have described. The heat is inconsiderable, the pulse is weak, scarcely quicker than ordinary, and the patient complains of but slight pains in the back and head. Here the treatment should be widely different from that

which has been mentioned when the fever is of the inflammatory kind. Bleeding in this case is hurtful, and even cool air must be admitted with caution. The business of the physician in this case is to excite a gentle action in the sanguiferous system, in order to produce the degree of action necessary to the eruption of the pock.—For this purpose he may recommend the use of warm drinks, and even of a warm bed with advantage.—If the eruption delays beyond the third day, with all the circumstances of debility that have been mentioned, I have frequently ordered patients to eat a few ounces of animal food, and to drink a glass or two of wine with the most desirable success. The effects of this indulgence are most obvious where the weakness of the fever and the delay of the eruption in children have made it necessary to allow it to mothers and nurses.—

The small-pox by Inoculation so seldom comes on with the symptoms of a putrid fever, that little need be said of the treatment proper in such cases. I shall only observe, that the cold regimen in the highest degree produces more success in these cases than in any other.—I have repeatedly been told, that when the

the small-pox appears confluent among the Africans, it is a common practice for mothers to rub their children all over with pepper, and plunge them immediately afterwards into a spring of cold water.—This, they say, destroys a great part of the poek, and disposes the remainder to a speedy suppuration. From the success that has attended the use of the cold bath in putrid fevers in some parts * of Europe mentioned in a former lecture, I am disposed to believe in the efficacy of the African remedy.

The fever generally lasts three days, and the eruption continues for a similar length of time, counting the last day of the fever as the first of the eruption. But this remark is liable to many exceptions. We sometimes observe the eruption to begin on the first, and often on the second day of the fever, and we sometimes

* In a dissertation entitled "*Epidemiae quae Wratislaviam, Anno 1737 afflixit,*" published in the appendix to the *Acta Nat. Curios.* Vol. I. it appears, that washing the body all over with cold water in putrid fevers, attended with debility, was attended with success at Breslau in *Silesia*. The practice has since been adopted by us, we are told by several of the neighbouring tries. CULLEN'S FIRST LINES OF PRACTICE OF PHYSIC.

cases in which a second eruption comes on the fever has abated for several days, and the first eruption considerably advanced in its progress towards a complete suppuration.—This is often occasioned by the application of excess of cold, or heat to the body, or by a sudden premature use of stimulating drinks, or animal food.

I come now to treat of the best method of mitigating troublesome and alarming symptoms.

The only *alarming* symptom is convulsions which children are subject during the time of the eruption. These have been less frequent, since the liberal and judicious use of cool air in eruptive fever than formerly. They are often cured by putting the feet in warm water. But the more effectual and speedy method of curing them is to expose our patients suddenly to the cold air. The colder the air the quicker relief it affords in these cases. To prevent the return of the fits, as well as to allay any disagreeable and troublesome startings, a few drops of Laudanum should be given. They generally yield in a short while to this excellent remedy.

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The next symptom which demands the our art is the inflammation and sore on the Poullices of all kinds should be laid attending to increase the inflammation and Instead of these, the part affected should be ed three or four times a day with cold water. This application is not only agreeable to patients, but soon checks the progress of inflammation, and disposes the sore to heal the time the eruption is completed. They should likewise be washed frequently with water to secure them from pustules and inflammation.—With respect to those alarming troublesome symptoms which occur in those where the pocks are numerous, or confluent happen so seldom in Inoculation that they come properly under our notice in this. They are moreover fully discussed by Doctors *have, Huxham, Hillary* and other writers.—

V. I come now in the last place to discuss

§. Where the inflammation on the has been so considerable, as not to yield immediately to the application of cold water, I have the vegeto-mineral water with advantage.

directions that are necessary after the eruption and suppuration are over.

It is well known that eruptions of an obnoxious nature sometimes follow the small-pox. I believe, are often occasioned by a too hasty and speedy use of animal food. To guard against these disagreeable consequences of relaxation, it is of the utmost importance to encourage a cautious and *gradual* return to the free use of an animal diet, and at the same time it will be necessary to give our patients a dose of purging physic.

Thus Gentlemen have I delivered to you a short history of the new method of inoculating the small-pox. I am aware that prejudices are entertained against some parts of it by physicians of the most ancient name and character living. I have witnessed the effects of the old and new methods of preparing the body, in many thousand patients, and I am satisfied not only from my own observations, but from the experience of Gentlemen upon whose sentiments I rely more than upon my own, that the new method is by far the safest and most successful.—Added to this, I can assure my pupils, I have never known a single instance of a patient

patient prepared and treated in the manner
have described, that ever had an abscess of
the small-pox, or even such an inflammation
or sore upon the arm as required the applica-
tion of a poultice.—

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